

## ROLE OF READING ENGAGEMENT IN MEDIATING EFFECTS OF READING COMPREHENSION INSTRUCTION ON READING OUTCOMES

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The engagement model of reading development suggests that instruction improves students' reading comprehension to the extent that it increases students' engagement processes in reading. We compared how Concept-Oriented Reading Instruction (CORI) (support for cognitive and motivational processes in reading), strategy instruction (support for cognitive strategies in reading), and traditional instruction in fourth-grade classrooms differentially influenced students' reading comprehension, strategy use, and engagement in reading. Students experiencing CORI were significantly higher than both comparison groups on reading comprehension, reading strategies, and reading engagement. When students' level of reading engagement was statistically controlled, the differences between the treatment groups were not significant. We infer that the level of students' reading engagement during classroom work mediated the instructional effects on reading outcomes.  
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The engagement model of reading comprehension development proposes that engagement in reading is the joint functioning of motivational processes and cognitive strategies during reading comprehension (Guthrie & Wigfield, 2000). In this perspective, highly engaged readers are both internally motivated and strategic, and less engaged readers show lower motivation and less use of strategies for comprehending text. Consistent with this perspective, Fredricks, Blumenfeld, and Paris (2004) proposed that engagement is a multidimensional attribute including behavioral engagement (actively performing academic learning tasks), cognitive engagement (using high-level strategies to foster deep learning), and emotional engagement (enjoying academic tasks and expressing enthusiasm about learning). In this investigation, we examined the construct of engaged reading as a mediating variable that may account for the effect of integrated instruction on reading comprehension of elementary school students.

Relatively few studies have attempted to increase reading engagement of elementary students experimentally or to examine the role of reading engagement in interventions that increase reading achievement. The few existing experimental studies of this age group have shown that at least four variables influence students' reading motivation: (a) autonomy support and choice, (b) use of interesting texts in classroom instruction, (c) having conceptual goals for reading instruction, and (d) supporting collaboration in reading. Guthrie and Humenick (2004) conducted a meta-analysis of the effects of these variables on reading motivation, identifying 22 studies that enabled 131 experimental comparisons to be made. Average effect sizes were 0.95 for choice, 0.72 for conceptual goals, 1.15 for providing interesting text, and 0.52 for collaboration. However, these studies were short term (1–6 hours), laboratory based (nonclassroom), with high teacher–pupil ratio (1–5) and limited materials (e.g., three 500-word passages), and thus have limited applicability to typical classroom conditions.

Although there have been studies of classroom practices related to engagement, the investigations have been related to achievement generally (Assor, Kaplan, & Roth, 2002; Skinner, Wellborn, & Connell, 1990), mathematics in middle school (Ryan & Patrick, 2001), or to how teacher–student and parent–student relationships relate to young children's reading achievement (Hughes & Kwok,

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2007). These studies have primarily used correlational and structural equation modeling approaches. Thus, the important topic of whether engagement practices in classrooms increase reading comprehension in later elementary school has not been addressed with experimental or quasiexperimental designs.

Some qualitative studies of engagement-supporting practices for reading in the elementary school classroom have been conducted. Teachers nominated to be outstanding appear to support students' engagement through their enthusiasm, giving positive feedback, and organizing the classroom attractively (Dolezal, Welsh, Pressley, & Vincent, 2003). In a correlational study, Taylor, Pearson, Clark, and Walpole (2000) showed that in high-achieving, high-poverty schools, the teaching practice of asking high-level questions correlated with students' levels of active learning and with reading comprehension. However, neither study attempted to determine whether the instructional effects on comprehension were attributable to students' engagement in reading.

### *Concept-Oriented Reading Instruction*

We developed Concept-Oriented Reading Instruction (CORI) to foster elementary school children's reading comprehension, motivation, and engagement in reading (see Guthrie, 2004; Guthrie, Wigfield, & Perencevich, 2004, for a detailed overview of CORI). CORI is a reading comprehension instructional program that integrates science (or social studies) and reading through activities and the use of science books in reading instruction. Students learn a variety of reading strategies documented in the National Reading Panel Report (National Reading Panel, 2000) as being effective for fostering reading comprehension. CORI also includes several instructional practices designed to foster students' engagement in reading; these are described later in this article. CORI's design is based on the engagement model of reading development mentioned previously (Guthrie & Wigfield, 2000). In this model, it is proposed that when readers are fully engaged in reading they comprehend better, use reading strategies effectively, and are motivated to read.

Previous work assessing the impact of CORI has shown that CORI increased reading comprehension and motivation to read in comparison to an instructional program focused on teaching reading strategies, or a traditional reading instruction program that relied primarily on basal texts (Guthrie, Wigfield, Barbosa, et al., 2004). However, the previous work did not attempt to determine whether CORI increased reading engagement or whether the positive effects of CORI on reading comprehension were due to students' increased level of engagement in reading during instruction. This study is the first attempt to investigate the effects of integrated instruction on measures of reading engagement and determine whether the instructional effects on reading comprehension are attributable to their effects on students' levels of engagement in reading during instruction. Furthermore, previous studies have reported effects of CORI on third-grade students (Guthrie, Wigfield, Barbosa, et al., 2004) or third- and fifth-grade students (Guthrie, Wigfield, Metsala, & Cox, 1999); this study reports a unique set of data on fourth-grade students.

### *Study Objectives*

We suggest that it is important to determine whether the instructional effects on elementary students' reading comprehension are mediated by engagement in order to understand better why the intervention works. Any intervention that increases reading comprehension is complex, and when it succeeds, the positive outcomes could be due to a number of factors. For instance, it is possible that effects of instruction are attributable to a factor such as enhanced cognitive strategy use (National Research Panel, 2000), enhanced social interaction among students (Ryan & Patrick, 2001), or metacognition (Souvignier & Mokhlesgerami, 2006), rather than being due to greater engagement. Empirical evidence is required to assess these possibilities. The main theoretical expectation

underlying this study was that the effects of instruction on students' reading comprehension and reading strategies would be mediated by the students' level of reading engagement. In other words, we expected that the engagement practices would increase comprehension only to the extent that those practices facilitate students' frequency and depth of engaged reading.

To examine this expectation, we used the following adaptation of the Baron and Kenny (1986) criteria for establishing mediation among variables: (a) students' reading engagement should relate positively to their reading outcomes (comprehension and strategies); (b) engagement practices in instruction should have a positive effect on reading outcomes and reading engagement; and (c) when the contribution of students' engaged reading to their reading outcomes is statistically controlled, the instructional effect of the engagement practices on outcomes is reduced or eliminated.

The three questions guiding this study were (a) To what extent is the construct of engaged reading associated with reading comprehension in a classroom-based study? (b) To what extent do the engagement practices used by CORI teachers increase students' reading engagement and reading comprehension in comparison to teachers using strategy instruction and traditional basal instruction? and (c) To what extent are instructional effects of the treatment groups on reading comprehension mediated by the students' levels of reading engagement?

## METHOD

### *Participants*

The original sample for the study included 492 fourth-grade students from five schools in a small mid-Atlantic city who participated with parental permission. The ethnicity and gender of the participants in the schools did not differ significantly from each other, nor were they significantly different from the district. Across the schools, ethnicity was Caucasian, 68%; African American, 20%; Hispanic, 5%; Asian, 4%; and other, 4%.

Originally, there were 23 teachers in the study: 9 CORI teachers, 11 strategy instruction (SI) teachers, and 3 traditional instruction (TI) teachers. After deletion due to matching or lack of evidence for implementation, there were 5 CORI, 7 SI, and 3 TI teachers, for a total of 15 teachers in the data analysis. In each treatment condition (CORI and SI), two teachers were dropped due to low implementation. A treatment fidelity check with classroom observations and videotapes was made using the procedure reported in Guthrie, Wigfield, Barbosa, et al. (2004). In each treatment, one teacher was low due to total lack of professional development resulting from last minute hiring by the principal. In each treatment, one teacher was exceptionally low due to failure to learn, internalize, and implement the model. The instructional models were not scripts and required extensive expertise that not all teachers acquired. In addition, the SI schools were relatively high in SES and entering achievement. Thus, two of the highest achievement classrooms in SI schools and two of the lowest-achieving classrooms in CORI schools were dropped to equate the entering reading achievement levels. This permitted the equivalent groups, pre- and postdesign analyses to be performed. There were 315 students included in these analyses.

### *Design*

We used an equivalent group's pretest–posttest design (Pedhazur & Schmelkin, 1991). District administrators selected five schools judged to be comparable in demographic characteristics and past reading achievement. We assigned them to CORI, SI, or TI using the criteria that the schools in each treatment are as comparable as possible in SES (which could not be quantified according to district policy) and ethnicity. Two schools were assigned to CORI, two to SI, and one to TI. We asked each principal and grade 4 teacher team if they wanted to participate in the defined condition and the accompanying professional development. Within schools, a few teachers did not participate.

In one SI school, one teacher declined due to illness, and in one CORI school, one teacher did not receive the training. With these constraints, it is reasonable to state that classrooms were the units in which the instruction occurred, as well as the units in which the measures were administered, and were intact groups prior to the study. Therefore, the classroom was the unit of assignment to treatments and the unit of analysis. For statistical analysis of the characteristics of the measures, analyses were conducted at the individual level. For correlations among the variables used in the multivariate analyses of variance (MANOVAs), analyses were conducted at the classroom level of aggregation.

As discussed in the results sections, MANOVAs indicated that the treatment groups (CORI, SI, TI) were equivalent at pretest on the three reading variables of standardized reading comprehension, multiple text comprehension, and reading comprehension strategies, as well as students' reading motivation, which is a prerequisite of the equivalent group's pretest-posttest design. Given these results at pretest, an analysis of covariance to adjust for students' entering levels of variables is not recommended when the groups are comparable, due to inevitable error in the measure used as a covariate (Pedhazur & Schmelkin, 1991).

### *Measures of Reading Comprehension and Strategy Use*

The Gates-MacGinitie Comprehension Test, as well as an author-designed performance assessment of reading comprehension and strategy use, were conducted as a pretest in the first week of September 2003 and as posttests the second and third weeks of December 2003. Teachers administered assessments in their classrooms in four 60-minute periods. All data on measures were reported at the individual level.

*Gates-MacGinitie Standardized Reading Test.* Alternative forms of the Gates-MacGinitie Comprehension Test (level 4) were administered in a 50-minute period, and the extended scale score was used for data analysis. This test is widely used nationally and has excellent psychometric properties. It provided a general measure of reading comprehension not related to the specifics of the instructional approaches in this study.

*Performance Assessment.* The performance assessment consisted of (a) elicitation of background knowledge, (b) student questioning, (c) searching for information, and (d) multiple text reading comprehension (writing knowledge gained from text). Three alternative forms of these tasks were used to allow counterbalancing across pre- and posttest. This provided an opportunity to determine whether the cognitive strategies we attempted to teach were actually learned. There were three parallel forms, consisting of (a) ponds and deserts, (b) rivers and grasslands, and (c) forests and oceans. For the multiple text comprehension measure, the alternative forms consisted of three reading packets representing multiple trade books developed by the research team. Each packet contained 75 pages in 22 sections, with 16 sections relevant to the topic and 6 distracter sections. Packets contained an equal number of easy (grades 2–3) and difficult (grades 4–6) texts, representing the nine ecological concepts and defining information on the biomes. Students were administered the assessments by their classroom teachers. Classrooms were randomly assigned packets so that an equal number of students received each packet. In addition, forms were counterbalanced at pre- and posttest. Next, we describe the measures of reading strategy use and comprehension.

*Background Knowledge.* Students first wrote what they knew about plant and animal life in their assigned biome (e.g., ponds and deserts, rivers and grasslands, oceans and forests). They were given 15 minutes to perform an open-ended writing activity. Responses were coded to a six-level rubric that measured the amount and depth of their prior knowledge about the topic before reading about it in the assessment (See Guthrie & Scaffidi, 2004, for a detailed description of the rubric.)

Interrater agreement on the rubric coding for 26 student responses was 100% adjacent (1 point difference on a 6-point scale) and 77% exact (identical score on the 6-point scale). At pretest, the entering background knowledge of CORI, SI, and TI students was not significantly different, showing that they began the intervention similarly knowledgeable about the content of survival in biomes. This similarity facilitated the investigation of the effects of engagement practices on reading comprehension.

*Questioning.* After briefly reviewing the reading packet, students were instructed to write their questions on the topic. During this 15-minute period, students were encouraged to write as many good questions as possible about what the biomes were like and how animals survived in them. Questions were coded to a four-level rubric, with each level indicating a higher conceptual content in the question (Guthrie & Taboada, 2004). Students wrote 0 to 10 questions and were given a rubric score of 1 to 4 for each question and a score of zero if they did not write a question. On the basis of 10 possible questions, a student's score could range from 0 to 40. The mean of each student was used for data analysis. Interrater agreement on 100 questions for 25 students was 100% for adjacent and 90% for exact coding. Cronbach's alpha for questioning was 0.82.

*Searching for Information.* Students searched the packets and took notes on what they learned in one 10-minute activity and in a subsequent 40-minute activity the following day. Students were given general goals for searching, consisting of the following questions: How are the two biomes (e.g., rivers and grasslands) different? What lives in a river? What lives in a grassland? How do they live there? How do they help each other live? Students then selected specific topics from a multitext packet for further reading and took notes for themselves. Some packets were relevant to the questions, and some were not relevant. All students identified at least 1 and could have identified 16 relevant packets. Students recorded each packet that they selected as they read, and the number of relevant packets they selected was their "searching" score. Across-time correlation of these scores was  $r(173) = 0.30$ ,  $p < .001$ .

*Multiple Text Comprehension.* In an open-ended, constructed-response task, students wrote what they knew after reading. They were given 30 minutes to express their knowledge, with two statements of encouragement after 7 and 13 minutes. Written responses were coded to the same six-level rubric used for background knowledge described previously. Interrater agreement for 20 responses was 100% for adjacent and 80% for exact coding. A third rater resolved differences. Across-time correlation of these responses for parallel forms was  $r(151) = 0.46$ ,  $p < .001$ . The parallel forms were on different topics in science including ponds-deserts, rivers-grasslands, and oceans-forests. Thus, the correlation was reduced due to variations in students' background knowledge of these topics and due to variations in the texts on the topics. The measures were administered in September and December, and the 4-month time difference reduced the correlations between forms. Thus, the correlation was viewed as moderate to strong for this age group. Concurrent validity was indicated by its correlation with the Gates-MacGinitie Comprehension Test of  $r(160) = 0.35$ ,  $p < .001$  in December. The multiple text comprehension used a written response, whereas Gates-MacGinitie was multiple choice. The multiple text task was one long text of 75 pages, whereas the Gates had texts of one-half page consisting of 150 words. Thus, the moderate correlation was due to task differences.

*Composite of Strategies.* To examine strategies as a group, we formed a composite consisting of the sum of the scores for activating background knowledge and questioning. Searching was not used because it was not well correlated with the other strategy variables or reading comprehension variables. At the individual level, the strategy composite correlated with multiple text comprehension

at  $r(168) = 0.43$ ,  $p < .001$ , and with the Gates-MacGinitie Comprehension Test at  $r(165) = 0.52$ ,  $p < .001$ .

*Scales.* From these strategy tasks, the following measures were derived: (a) *background knowledge*, coded 1 to 6 to the knowledge rubric; (b) *questioning*, coded 0 to 4 to the questioning rubric; (c) *searching*, scored 1 to 12 for number of correctly identified sections of the multitext packet; (d) *multiple text reading comprehension*, coded 1 to 6 to the knowledge rubric (same as the rubric used for background knowledge); and (e) *strategy composite*, scored 1 to 10 consisting of the sum of questioning and activating background knowledge.

### *Measures of Reading Engagement and Reading Motivation*

*Reading Engagement Index.* The Reading Engagement Index (REI) measured the extent to which each student was an engaged reader within the classroom, according to the teacher's perception. Consistent with our definition of engaged reading as a multidimensional construct including cognitive, motivational, and behavioral characteristics, we included multiple dimensions in a teacher rating scheme. Teachers rated each student in their classrooms on the following items in this order: (a) reads often independently (behavioral), (b) reads favorite topics and authors (motivation–intrinsic), (c) distracts easily in self-selected reading (motivation–intrinsic reverse coded), (d) works hard in reading (cognitive–effort), (e) is a confident reader (motivation self-efficacy), (f) uses comprehension strategies well (cognitive–strategies), (g) thinks deeply about the content of texts (cognitive–conceptual orientation), and (h) enjoys discussing books with peers (motivation–social). The response format was 1 = *not true* to 4 = *very true*. Students could receive a score of 7 to 35. Cronbach's alpha reliability of all items was 0.92 for this sample. Teachers rated all students in a classroom in one 20-minute session. The items and format for the REI are available from the authors.

To optimize the measurement characteristics of the REI, we selected items on the REI that correlated at  $p < .01$ , with the students' self-reported motivation measured by the Motivations for Reading Questionnaire (Wigfield & Guthrie, 1997). Items meeting this criterion were items c, d, e, and f, and we call this measure the REI-Revised (REIR). Alpha reliability for the REIR was 0.89 for this sample. Factor analysis of items on the REIR showed that one factor accounting for 71% of the variance, and the lowest item loading on the factor was 0.70. At the individual level, the REIR correlated with the MRQ in December at  $r(134) = 0.31$ ,  $p < .001$ . This is consistent with findings from Guthrie et al. (2007) showing that self-reports of motivation such as the MRQ and teacher reports of students' motivation such as the REIR were moderately but not highly correlated. REIR correlated with the Gates-MacGinitie in December at  $r(131) = 0.39$ ,  $p < .001$ ; REIR correlated with the multiple text comprehension at  $r(126) = 0.37$ ,  $p < .001$ . At the classroom level of aggregation, the correlation of 0.44 of the REIR with the MRQ was not statistically significant. At the classroom level, REIR correlated with the Gates-MacGinitie at  $r(14) = 0.54$ ,  $p < .05$  and with multiple text comprehension at  $r(14) = 0.57$ ,  $p < .05$ .

*Motivations for Reading Questionnaire.* To measure reading motivation, students responded at pre- and posttest to an abbreviated version of the Motivations for Reading Questionnaire (MRQ; Wigfield & Guthrie, 1997), which assesses a variety of students' reading motivations. In this study, we assessed the intrinsic motivation dimensions of preference for challenge, involvement, curiosity, and self-efficacy using 18 items from the longer MRQ, with a scale of 18 to 72 for each student. Examples of the items are *preference for challenge* (“I like hard, challenging books”); *involvement* (“I enjoy a long involved story or book”); *curiosity* (“I have favorite subjects I like to read about”); and *self-efficacy* (“I am a good reader”). Cronbach's alpha reliability was 0.88 for this sample in December.

### *Instructional Frameworks*

*Concept-Oriented Reading Instruction.* As noted earlier, CORI is based on the engagement model of reading development (Guthrie & Wigfield, 2000). The model suggests that effective instruction for comprehension includes support for motivational, cognitive, conceptual, and social processes within the classroom. Within CORI, students' processes of engagement were explicitly supported through five practices: (a) using content goals in a conceptual theme for reading instruction, (b) affording choices and control to students, (c) providing hands-on activities, (d) using interesting texts for instruction, and (e) organizing collaboration for learning from text (see Guthrie, 2004). To implement the practice of using content goals in a conceptual theme during reading instruction, students were taught reading comprehension in the theme of ecology, following the science goals prescribed by the school district.

*Strategy Instruction in CORI.* Systematic, explicit instruction in reading comprehension was provided in CORI. This instruction was embedded in the six practices designed to support reading engagement. Explicit strategy instruction was provided for the following reading comprehension strategies: (a) activating background knowledge, (b) questioning, (c) searching for information, (d) summarizing, (e) organizing graphically, and (f) identifying story structure. Each of the six strategies was taught for 1 week in the order presented (a) through (f), and in the next 6 weeks, strategies were systematically integrated with each other. The exception was story structure, which was taught in all weeks. This sequence enabled students to gain command of the individual strategies, as well as to fuse them in complex comprehension activities in the classroom. Throughout, the strategies were modeled by the teacher and scaffolded according to students' needs, with guided practice provided. This frame is similar to the recommendations and practices for multiple strategy instruction as described in the National Reading Panel Report (National Reading Panel, 2000).

*Science in CORI.* In CORI, science inquiry was integrated with reading, which has been shown to increase both reading and science comprehension (Romance & Vitale, 1992). The program theme of "Hidden Worlds of Woodlands and Wetlands" met the district science requirements, as well as the reading and writing requirements. This theme was taught in two related 6-week units. Within each 6-week unit, students were taught the theme's 11 science core concepts: (a) competition, (b) locomotion, (c) feeding, (d) reproduction, (e) respiration, (f) predation, (g) defense, (h) communication, (i) adaptation to habitat, (j) niche, and (k) conservation of habitat.

### *Strategy Instruction*

The second instructional framework used as a treatment condition in this study was SI. The implementation was designed to be as similar as possible to existing practices of multiple strategy instruction that are consistent with research-based recommendations (National Reading Panel, 2000) and to the strategy instruction in CORI described previously. Teachers used the materials within their schools consisting of basal programs and some trade books. SI teachers used information texts for science and social studies as approximately 30% of their reading materials. The SI teachers taught the same county-based life science objectives (with heavy emphasis on ecology) and included the same science observations and activities (e.g., aquariums) as the CORI teachers. No explicit support for student motivation was stipulated in the SI program, although teachers used a variety of practices to motivate their students to read. In particular, SI teachers provided support for students' self-efficacy by enabling them to become confident in using strategies as tools to improve their reading. The sequence of strategies was the same in SI and CORI.

### *Traditional Instruction*

TI consisted of three classrooms in a school selected by the district to be comparable to the CORI and SI schools. Teachers provided their normal reading and language arts instruction with basal materials, trade books, and vocabulary books. We collected pre- and posttest data, but did not provide professional development, or any materials to these classrooms.

### *Professional Development*

Summer workshops provided professional development for the CORI and SI models. CORI teachers participated in a 10-day workshop that included viewing examples of instruction; performing the reading strategies; discussing motivational practices; constructing reading/science integrations; identifying books appropriate for this instruction; and planning for the 12-week theme, using a teacher's guide created by the project's staff. SI teachers participated in a 5-day workshop that included viewing examples of instruction; performing the reading strategies; discussing motivational practices; identifying books appropriate for this instruction; and planning 12 weeks of instruction, using a teacher's guide created by the project's staff.

### *Implementation of Instructional Models*

CORI was implemented in all classrooms of two schools to all fourth-grade students. The program was administered for 12 weeks, from the second week in September to the second week in December. Class size in one school averaged 22 students, and the other school averaged 27 students. CORI lasted 90 minutes each afternoon in both schools. SI was implemented for all third-grade students in all classrooms of two different schools from the second week in September to the second week in December. It also lasted 90 minutes each afternoon in both schools. TI was implemented in all classrooms in one school for 90 minutes daily from September to December. For CORI, SI, and TI models, students who were reading at the 2.0 level or below in September of grade 4 were taught out of the classroom by special education teachers for 30 minutes, approximately three times per week, in addition to their classroom instruction. These students all had individualized education plans designed by school personnel. Struggling readers, who were not eligible for special education or were not more than 2 years below grade level in reading, were taught within the classrooms for all models.

Fidelity of implementation was assessed by videotaping teachers twice (after about 5 weeks of implementation and after about 9 weeks) and rating the quality of their instruction (see Guthrie, Wigfield, Barbosa, et al., 2004). Raters were graduate students guided by one senior investigator. Interrater agreement was an average of 70% exact and 92% adjacent agreement on a 6-point scale of implementation quality for each engagement practice. Using data from the implementation measure, we conducted an analysis of variance. The dependent variable was the sum of the six engagement practices, consisting of (a) knowledge goals for instruction, (b) autonomy support, (c) use of interesting texts, (d) collaboration support, (e) science processes connected to reading, and (f) strategy instruction. A variable of program control was added to represent teaching in TI classrooms. It refers to instruction guided exclusively by a basal reading manual. The independent variable was the instructional group, CORI, SI, and TI (Table 1). Teachers in CORI classrooms scored higher than SI teachers, who scored higher than TI teachers, in the sum of these engagement practices,  $F(2,12) = 55.24, p < .001$ . Using the criterion of three standard errors of the mean, CORI was rated higher than SI and TI in all six of the engagement practices. SI was rated higher than TI on the engagement practices of strategy instruction and use of interesting texts, but not on the other practices.

Table 1  
*Implementation of Engagement Practices According to Instructional Group*

		CORI	SI	TI	Total
Strategy instruction	<i>M</i>	8.40	4.29	1.00	5.00
	<i>SD</i>	0.89	1.98	2.64	3.27
	<i>SEM</i>	0.40	0.75	1.53	0.84
Knowledge goals	<i>M</i>	8.20	2.57	-1.00	3.73
	<i>SD</i>	0.84	3.31	1.00	4.20
	<i>SEM</i>	0.37	1.25	0.58	1.08
Interesting texts	<i>M</i>	7.00	4.00	0.33	4.27
	<i>SD</i>	0.71	2.00	2.31	2.94
	<i>SEM</i>	0.32	0.76	1.33	0.76
Autonomy support	<i>M</i>	7.20	0.57	-1.00	2.47
	<i>SD</i>	2.05	1.61	1.00	2.93
	<i>SEM</i>	0.92	0.61	0.58	0.76
Collaborative support	<i>M</i>	7.00	0.43	0.33	2.60
	<i>SD</i>	1.87	1.27	1.52	3.52
	<i>SEM</i>	0.84	0.48	0.88	0.91
Hands-on science	<i>M</i>	5.80	0.14	0.00	2.00
	<i>SD</i>	2.28	0.38	0.00	3.05
	<i>SEM</i>	1.02	0.14	0.00	0.79
Program control	<i>M</i>	0.00	0.00	4.67	1.00
	<i>SD</i>	0.00	0.00	2.51	2.21
	<i>SEM</i>	0.00	0.00	1.45	0.59
Sum	<i>M</i>	43.60	12.00	4.33	20.07
	<i>SD</i>	4.28	6.83	8.14	18.82
	<i>SEM</i>	1.91	2.58	4.70	4.86

Note. SEM = standard error of the mean.

## RESULTS

The first research question was: To what extent is children's reading engagement associated with their reading comprehension? Means and standard deviations of the three instructional groups are presented in Table 2, and correlations (computed at the classroom level) are presented in Table 3. Note that the *n* at the classroom level of aggregation was 5 CORI, 7 SI, and 3 TI teachers for a total of 15. Correlations among the variables in this study confirmed the expectation that engaged reading correlated with reading comprehension. As Table 3 shows for the variables in December, the teachers' rating of reading engagement (REIR) correlated significantly with the Gates-MacGinitie Comprehension Test,  $r(14) = 0.57$ ,  $p < .05$ ; multiple text comprehension,  $r(14) = 0.55$ ,  $p < .05$ ; and the strategies composite,  $r(14) = 0.62$ ,  $p < .05$ . Students' self-reports of motivation (MRQ) did not correlate significantly with reading comprehension.

The second research question was: To what extent does CORI in comparison to SI and TI increase students' reading engagement, reading comprehension, and reading strategies? To investigate this, we first examined (using a one-way MANOVA) the effect of instructional groups on the pretest scores on the Gates-MacGinitie, multiple text comprehension, reading strategy composite, and reading motivation as measured by the MRQ. As Table 4 shows, there were no statistically significant differences on any of the pretests.

We next conducted a MANOVA with the independent variable of instructional groups (CORI, SI, TI) and the dependent variables of Gates-MacGinitie, multiple text comprehension, reading

Table 2  
Means and Standard Deviations of Variables Measured at Posttest According to Instructional Group

		CORI	SI	TI	E. S. CORI/SI	E. S. CORI/TI
Gates-MacGinitie	<i>M</i>	516.60	484.86	484.00	1.29	1.32
	<i>SD</i>	28.39	16.78	8.72		
Multiple text comprehension	<i>M</i>	4.30	3.00	2.67	1.60	2.01
	<i>SD</i>	0.67	0.00	0.58		
Strategies composite	<i>M</i>	4.50	3.36	3.50	1.50	1.31
	<i>SD</i>	0.80	0.41	0.50		
Searching	<i>M</i>	5.40	5.36	4.17	0.04	1.50
	<i>SD</i>	0.82	0.99	0.29		
Prior knowledge activation	<i>M</i>	2.70	2.00	2.33	1.55	0.63
	<i>SD</i>	0.45	0.00	0.58		
Questioning	<i>M</i>	1.54	1.31	1.32	1.21	0.78
	<i>SD</i>	0.34	0.19	0.28		
Reading engagement—teacher rating	<i>M</i>	22.37	17.36	18.33	1.64	1.32
	<i>SD</i>	1.97	2.54	1.53		
Motivation self-report	<i>M</i>	64.50	60.93	63.17	0.83	0.66
	<i>SD</i>	3.04	4.32	2.02		

Table 3  
Correlations of Student Achievement and Student Engagement Variables at Posttest

	1	2	3	4	5	6	7	8
1. GM comprehension	—							
2. Multiple text comprehension	0.83**	—						
3. Reading strategies	0.89**	0.82**	—					
4. Searching	0.27	0.19	0.15	—				
5. Abk	0.56*	0.70**	0.78**	-0.14	—			
6. Questioning	0.74**	0.59*	0.84**	0.03	0.58*	—		
7. Reading engagement	0.57*	0.55*	0.62*	0.26	0.54*	0.23	—	
8. Self-reported motivation	0.09	0.24	0.23	-0.17	0.44	-0.08	0.44	—

Note. GM = Gates-MacGinitie; Abk = activating background knowledge.  
\*\**p* < .01; \**p* < .05; +*p* < .10.

Table 4  
Multivariate Analyses to Investigate Mediation of Instructional Effects by Reading Engagement—Pretests

Analysis Type	Dependent Variables	Independent Variables	Covariate	<i>F</i>	<i>df</i>	Sig <i>F</i>
Multivariate analysis of variance (pretests)	Gates-MacGinitie; multiple text comprehension, strategy composite, motivation (REI report)	Instructional groups (CORI, SI, TI)	None	<1	8,18	ns
Univariate follow-up	Gates-MacGinitie	CORI SI	None	1.42	2,12	ns
		CORI TI		2.34	2,12	ns
		SI TI		<1	2,12	ns

Table 5  
*Multivariate Analyses to Investigate Mediation of Instructional Effects by Reading Engagement—Posttests*

Analysis Type	Dependent Variables	Independent Variables	Covariate	<i>F</i>	<i>df</i>	Sig <i>F</i>
Multivariate analysis of variance	Gates-MacGinitie; multiple text comprehension; strategies; engagement	Instructional groups (CORI, SI, TI)	None	4.10	8,18	0.006
Univariate follow-up	Gates-MacGinitie	Instructional Group	None	4.83	2,12	0.029
	Multiple text	Instructional Group	None	16.18	2,12	0.000
	Strategies	Instructional Group	None	6.03	2,12	0.015
	Engagement	Instructional Group	None	8.30	2,12	0.005

strategies composite, and engagement measured at posttest. As shown in Table 5, the main effect of instructional group was significant,  $F(8,18) = 4.10$ ,  $p < .006$ . As indicated in Table 5, the univariate follow-up tests were statistically significant for each dependent variable at  $p < .05$ .

On students' engagement, post hoc comparisons showed that CORI was significantly higher than SI,  $p < .002$ ; CORI was significantly higher than TI,  $p < .024$ ; and SI and TI did not differ significantly. Post hoc comparisons showed that on the Gates-MacGinitie, CORI was significantly higher than SI,  $p < .014$ ; CORI was significantly higher than TI,  $p < .036$ ; and SI and TI did not differ significantly. On multiple text comprehension, post hoc comparisons showed that CORI was significantly higher than SI,  $p < .000$ ; CORI was significantly higher than TI,  $p < .000$ ; and SI and TI did not differ significantly. On the reading strategies composite, CORI was significantly higher than SI,  $p < .006$ ; CORI was significantly higher than TI,  $p < .036$ ; and SI and TI did not differ significantly. These results indicate that the instructional practices in CORI increased students' reading comprehension on two comprehension measures, reading strategies, and reading engagement, in comparison to SI and TI students.

The third and most important research question was: To what extent are the instructional effects on reading comprehension mediated by the students' levels of reading engagement? To address this question, we conducted a multivariate analysis of covariance (MANCOVA) with instructional groups (CORI, SI, TI) as the independent variable, and dependent variables consisting of the Gates-MacGinitie, multiple text comprehension, and reading strategies composite, with reading engagement as the covariate. As expected, the effect of treatment was not statistically significant for this analysis (Table 6). Furthermore, on the univariate follow-up tests, the instructional effect was not statistically significant for Gates-MacGinitie reading comprehension or reading strategies. Comparing this result to the previous analysis, in which the same independent variable had a statistically

Table 6  
*Multivariate Analyses to Investigate Mediation of Instructional Effects by Reading Engagement—Posttests and Covariate*

Analysis Type	Dependent Variables	Independent Variables	Covariate	<i>F</i>	<i>df</i>	Sig <i>F</i>
Multivariate analysis of variance	Gates-MacGinitie; multiple text comprehension; strategies	Instructional groups (CORI, SI, TI)	Engagement	<1	3,6	ns
Univariate follow-up	Gates-MacGinitie	Instructional Group	Engagement	1.12	2,11	ns
	Multiple text	Instructional Group	Engagement	9.33	2,11	0.004
	Strategies	Instructional Group	Engagement	1.51	2,11	ns

significant effect on the reading comprehension variables when the covariate was not present, we construct the conditions needed in the Baron and Kenny (1986) framework for inferring mediation. In this case, the effects of the instructional condition on the reading outcomes of reading comprehension and reading strategies were mediated by the variable of reading engagement. Students in the different instructional conditions made progress on the outcome measures of reading comprehension and strategies to the degree that they were highly engaged in reading determined according to the teachers.

For multiple text comprehension in univariate follow-up of the MANCOVA, instruction showed a statistically significant effect. According to Baron and Kenny (1986), partial mediation can be said to occur when a mediator reduces but does not eliminate an instructional effect, which is what occurred here. On the two most generalizable variables, the Gates-MacGinitie standardized test and reading strategies, the mediation was fully observed, whereas on the variable most related to instruction, multiple text comprehension, mediation was partially observed.

#### DISCUSSION

The theoretical framework guiding this study defines *engaged reading* as the joint functioning of motivational processes and cognitive strategies during reading comprehension activities (Guthrie & Wigfield, 2000). Highly engaged readers are very strategic, using such comprehension strategies as questioning and summarizing to gain meaning from text. Likewise, highly engaged readers are internally motivated to read, while reading frequently and deeply. These processes of engagement in reading, we propose, are facilitated when classroom practices directly address them by providing instruction in the cognitive strategies and support systems for the motivational processes of reading. CORI is an instructional program designed to accomplish these things.

The first finding was that reading engagement and reading comprehension were correlated. As noted in the introduction, there is a growing body of literature documenting this association between reading engagement and comprehension. What is unique about the finding in this study is that it occurred for reading in a classroom-based study of elementary school students, with a measure of reading engagement that has not been used previously. This finding provides a basis for focusing on reading engagement during reading instruction and support for our theoretical framework that emphasizes engagement as crucial to comprehension (Guthrie & Wigfield, 2000).

The second major finding was that students experiencing CORI had higher reading comprehension, reading strategy use, and reading engagement than did students experiencing either strategy instruction or traditional reading instruction (as defined by the school district in which the study was done). This finding replicates and extends previous work on CORI done with third-grade students (Guthrie, Wigfield, Barbosa, et al., 2004) to fourth grade, and to a different set of science and reading materials and activities. The effects of CORI thus are robust across both third and fourth grade and different instructional topics. We attribute CORI's success to its incorporation of instructional practices teaching reading strategies known to promote comprehension growth and also practices to foster students' motivation. These sets of practices likely interact in complex ways to increase students' comprehension and motivation (see Guthrie, Wigfield, Barbosa, et al., 2004).

The third (and in our view) most important finding of this study was that students' engagement mediated the effects of instructional group on students' comprehension and strategy use outcomes. That is, the CORI instructional practices were successful in increasing comprehension to the extent that they enabled students to display engagement processes in a classroom. Where students did not respond to the instructional practices by showing a high level of reading engagement, comprehension and reading strategy outcomes were relatively low. As noted previously, much of the existing data on strategic and motivational instructional practices that impact reading comprehension come from well-controlled, semilaboratory studies that may not apply well to long-term reading instruction.

The present findings contribute important quasiexperimental, field-based evidence to the literature, suggesting that reading engagement is one important process that determines the effectiveness of instructional practices.

Previous investigations using CORI in comparison to other instructional approaches have shown that CORI increased reading comprehension in comparison to strategy instruction (Guthrie, Wigfield, Barbosa, et al., 2004) or traditional instruction (Guthrie et al., 1998; Guthrie, Wigfield, Barbosa, et al., 2004). However, these studies did not attempt to determine whether this effect on reading comprehension was due to students' level of engagement in reading during instruction. This is the first study to show that the benefits of CORI on measures of reading comprehension are attributable to the effects of these practices on students' quality of engagement in reading during instruction. This is important because, as noted in the introduction, the effects on reading comprehension of engagement practices in instructional programs such as CORI could be attributable to improved cognitive competency, such as fluency, or a social experience of the students. These factors also may help explain how CORI instructional practices increased reading comprehension. However, in this study there is direct evidence that it was the amount of reading engagement that improved reading comprehension.

An implication of this finding is that if reading instruction really improves achievement through increasing engaged reading during instruction, then it is important to study more closely the variety of instructional practices that influence students' motivation to read during instruction, as well as outside instruction. A practical implication of the main finding in this study is that teachers can attempt to optimize students' reading engagement in the classroom with a realistic expectation that this engagement will increase students' reading comprehension. Simultaneously, if teachers perceive that their comprehension instruction is not highly engaging, or even disengaging, they have reason to doubt that it will increase students' ultimate reading comprehension levels, even if that instruction involves teaching important reading strategies. In today's policy climate with a high level of test-driven instruction due to No Child Left Behind legislation, this implication merits attention from educators (Guthrie, Wigfield, & Perencevich, 2004).

Limitations of this investigation should be noted. First, we investigated a finite set of motivational practices, consisting of knowledge goals in a conceptual theme, hands-on experiences, autonomy support, interesting texts, and collaboration support. Many other potentially motivating practices, such as teacher display of personal interest in books, book fairs, and incentive programs, that encourage teacher–student dialogue (Dolezal et al., 2003) warrant study and are not covered by this set. The measure of reading engagement used here was limited to motivational and cognitive attributes. We did not include the potentially important aspect of social interaction (Hughes & Kwok, 2007), which should be studied as a process of reading engagement. One of our comprehension measures (the Gates-MacGinitie) was generalizable in the sense that it was not tied directly to the instructional program, but the other was comprehension of multiple information texts in science, which was related to the instruction. Future research should address the limitations of this study to determine more broadly how engagement mediates instructional effects.

## REFERENCES

- Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviors predicting students' engagement in schoolwork. *British Journal of Educational Psychology*, *72*, 261–278.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical consideration. *Journal of Personality & Social Psychology*, *51*, 1173–1182.
- Dolezal, S. E., Welsh, L. M., Pressley, M., & Vincent, M. M. (2003). How nine third-grade teachers motivate student academic engagement. *Elementary School Journal*, *103*, 239–267.

- Fredericks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*, 59–109.
- Guthrie, J. T. (2004). Classroom contexts for engaged reading: An overview. In J. T. Guthrie, A. Wigfield, & K. C. Perencevich (Eds.), *Motivating reading comprehension: Concept-oriented reading instruction* (pp. 1–24). Mahwah, NJ: Lawrence Erlbaum.
- Guthrie, J. T., & Humenick, N. (2004). Motivating students to read: Evidence for classroom practices that increase reading motivation and achievement. In P. McCardle & V. Chhabra (Eds.), *The voice of evidence in reading research* (pp. 329–354). Baltimore, MD: Brookes.
- Guthrie, J. T., & Scaffidi, N. T. (2004). Reading comprehension for information text: Theoretical meanings, developmental patterns, and benchmarks for instruction. In J. T. Guthrie, A. Wigfield, & K. C. Perencevich (Eds.), *Motivating reading comprehension: Concept-oriented reading instruction* (pp. 225–248). Mahwah, NJ: Lawrence Erlbaum.
- Guthrie, J. T., & Taboada, A. (2004). Fostering the cognitive strategies of reading comprehension. In J. T. Guthrie, A. Wigfield, & K. C. Perencevich (Eds.), *Motivating reading comprehension: Concept-oriented reading instruction* (pp. 87–112). Mahwah, NJ: Lawrence Erlbaum.
- Guthrie, J. T., Van Meter, P., Hancock, G., McCann, A., Anderson, E., & Alao, S. (1998). Does concept oriented reading instruction increase strategy use and conceptual learning from text? *Journal of Educational Psychology, 90*, 261–278.
- Guthrie, J. T., Wagner, A. L., Wigfield, A., Tonks, S. M., Humenick, N., & Littles, E. (2007). Reading motivation and reading comprehension growth in the later elementary years. *Contemporary Educational Psychology, 32*, 282–313.
- Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (3rd ed., pp. 403–422). New York: Longman.
- Guthrie, J. T., Wigfield, A., Barbosa, P., Perencevich, K. C., Taboada, A., Davis, M. H., et al. (2004). Increasing reading comprehension and engagement through concept-oriented reading instruction. *Journal of Educational Psychology, 96*, 403–423.
- Guthrie, J. T., Wigfield, A., Metsala, J. L., & Cox, K. E. (1999). Cognitive and motivational predictors of text comprehension and reading amount. *Scientific Studies of Reading, 3*, 231–256.
- Guthrie, J. T., Wigfield, A., & Perencevich, K. C. (Ed.). (2004). *Motivating reading comprehension: Concept-oriented reading instruction*. Mahwah, NJ: Lawrence Erlbaum.
- Hughes, J., & Kwok, O. (2007). Influence of student–teacher and parent–teacher relationships on lower achieving readers' engagement and achievement in the primary grades. *Journal of Educational Psychology, 99*, 39–51.
- National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4769). Jessup, MD: National Institute for Literacy.
- Pedhazur, E., & Schmelkin, L. (1991). *Measurement, design, and analysis: An integrated approach*. Mahwah, NJ: Lawrence Erlbaum.
- Romance, N. R., & Vitale, M. R. (1992). A curriculum strategy that expands time for in-depth elementary science instruction by using science-based reading strategies: Effects of a year-long study in grade four. *Journal of Research in Science Teaching, 29*, 545–554.
- Ryan, A., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal, 38*, 437–460.
- Skinner, E. A., Wellborn, J. G., & Connell, J. P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology, 82*, 22–32.
- Souvignier, E., & Mokhesgerami, J. (2006). Using self-regulation as a framework for implementing strategy instruction to foster reading comprehension. *Learning and Instruction, 16*, 57–71.
- Taylor, B. M., Pearson, P. D., Clark, K., & Walpole, S. (2000). Effective schools and accomplished teachers: Lessons about primary-grade reading instruction in low-income schools. *Elementary School Journal, 101*, 121–165.
- Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth of their reading. *Journal of Educational Psychology, 89*, 420–432.